APPARATUS FOR MEDICAL TREATMENT BY VIBRATIONS

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ABSTRACT

A device for the medical treatment of organic tissues by vibrations having a lever with two opposite ends and a longitudinal axis between them, and a bumper rigidly attached to one end of the lever, the lever being mounted for universal pivoting movement and for limited movement in the direction of its longitudinal axis. The end of the lever opposite to the end at which the bumper is mounted is arranged to engage a rotating eccentric cavity when pressure is put on the bumper.

11 Claims, 5 Drawing Figures
3,664,331

1 APPARATUS FOR MEDICAL TREATMENT BY VIBRATIONS

BACKGROUND OF THE INVENTION

The present invention refers to an apparatus for medical treatment by vibrations with prophylactic and curative application in a series of diseases of some external and internal tissues and mucous membranes of the human body, having a stimulating effect on the peripheral circulation, positive results in the treatment of superficial and progressive, acute and chronic deficiencies specific for some tissues with adulterated trophicity.

The invention finds a larger application field in stomatology, especially in some gum diseases, for example paradontal deficiencies, affections of sinuses etc. both in the incipient stage and in prophylactic conditions.

There are already known apparatus for medical treatment by vibrations, also called massage devices, which act on some tissues and mucous membranes like gums, in which vibrations are produced by an eccentric member; the to-and-fro movement being transmitted further on as a similar to-and-fro movement converted into a vibrating movement. These apparatus were further improved by providing a four bevelled faced cylinder fitted at the end of the driving spindle and acting on an arm equipped with an exchangeable massage bumper. This bumper comes back to its initial position each time thanks to a special spring which provides counter pressure. To drive these devices they can be fitted to a dental unit with a flexible shaft to the dental grinder.

These devices have limited performances, however, since only the vibration frequency can be varied due to the variable speed motor which is fitted to the dental unit, but the vibration amplitude and intensity produced by the bumper cannot be varied. However, in prophylactic and curative therapy of these diseases beside the variation of the vibration frequency, the variation of vibration amplitude and intensity are also necessary for the paradontal tissue therapy, in relation to the sensitivity and endurance possibilities of the patients. At the same time, the known devices do not have an electric protection or isolation system to exclude a possible electrocution of the patient, and the form and size of the element which acts as the bumper, representing the active part entering the patient's buccal cavity, is too big and difficult to support and be moved in some areas of difficult access due to the small available space in the buccal cavity.

From the standpoint of a thorough sterilization of the bumper equipped arm for each patient, this cannot be satisfactorily achieved, due to the fact that the active piece cannot be quickly disassembled under sterile conditions from patient to patient, so that maintenance becomes difficult.

SUMMARY OF THE INVENTION

These shortcomings are resolved by the device according to the present invention, which in order to achieve a more complete treatment, with prophylactic and curative application in various diseases of some tissues and external and internal mucous membranes of the human body, as for example gums, uses vibrations, with stimulating effect on the peripheral circulation, conveyed by bumpers. These vibrations have variable frequency, amplitude and intensity by means of a vibratory system composed of a lever equipped at one end with the bumper which is slightly pressed onto the tissue, in the middle area with a joint sphere and at the other end a little sphere which is in a bushing having a truncated cone boring eccentric to the bushing spindle which is drawn into rotary motion in order to transmit by friction to the bumper a vibrating impulse at the contact between the sphere and boring at every rotation of the bushing.

Frequency variation of the vibrations is obtained by the variable revolution of the bushing, the vibration amplitude variation is obtained by the moving vibrating lever equipped with the small sphere forwards and backwards in the eccentric truncated cone boring, and the vibration intensity variation is achieved by variation of the bumper pressure on the massaged tissue.

The above mentioned vibrating system is applied to a framework which is used also as the handle of the device, and on whose geometric axis is a spindle rotating in two bearings, which at one end bears the connecting means to a flexible cable driven by a motor with variable speed and at the other end the bushing with the eccentric boring in the shape of a truncated cone. The handle bears in front of the bushing a gearing composed of the vibrating lever with joint sphere and the means of moving the lever forwards and backwards in comparison to the bushing with the eccentric and truncated cone like boring.

The joint with the sphere, in which are included the sphere and the vibration transmitting lever, is composed on one side of a sustaining bushing with a spherical fitting and on the other side of an helicoid spring with a flat processed end, and can be moved forwards and backwards inside the handle by screwing up on unscrewing the terminal nut of the handle under the spring's tension.

The vibration transmitting lever bears a bushing on the outer side of the handle for the connection of the bumper ended arm, which has means for quickly changing and fixing the different bumper types, as well as providing an electric isolation of the bumper equipped arm.

The bumpers can have different shapes and hollows to place therein vitaminic substances, oily or as paste, in order to control local infectious agents and excite the nervous system at the paradontal tissue lever, and by fixing the drug in the respective area, by the transistissular approach, producing also a slight hypertension.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional, partly schematic, side elevational view through the apparatus for treatment of the gum tissues by vibrations according to the present invention. FIGS. 2a–d are cross-sectional views through different bumper shapes.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The device according to the present invention includes a framework 1, which forms the device's handle and through which passes a spindle 2, which rotates in two interchangeable and removable bearings 3,4; one end of the spindle 2 entering into an eccentrically bored out truncated cone bushing 5, constructed of a hard material to allow a frequency up to about 18,000 vibrations per minute. One end of spindle 2 is secured to the bushing 5 by a screw 6, the other end of the spindle 2 being fixed in a coupling bushing 7, having a square hole with two thin plates; the securing with the spindle 2 being made by pin 8. The bushing 7, with a square hole, is protected at the exterior by a bushing, or sleeve, equipped with a release for the coupling of the flexible cable's terminal part from the dental unit or dental grinder, which is coupled to the device by the tightening screw nut 10. The actuating spindle 2 is continuously greased by means of some felt gaskets, 11,12, the oil being supplied through an orifice with screw 13. To the handle 1, is bound by the screw thread, a conical piece 14, houses inside the vibrating system composed of the bushing 5 with a truncated cone like eccentric boring, or cavity, within which a vibrating lever is sliding; this lever is formed of a conical spindle 15 constructed, out of a hard alloy, with a sphere c equipped joint, and is, provided at one end with a small sphere, b. The spindle 15 is maintained in position by a helicoidal spring 16 with a flat processed end resting on sphere c of the joint, through which passes the conducting pin 17, of the spindle 15, on an axial course to be manipulated by an adjusting screw nut 18, for varying the vibrations amplitude. This is due to the face that the small sphere b engages in and moves on variable sections of the eccentric truncated cone like bushing 5. The connection between the screw nut 18 and the sphere c is made by means of a plastic sustaining bushing 19,
which has a spherical fitting permanently biasing, or pressing the joint sphere c against the spring 16, the shifting of the joint sphere c between a first position and a second position being limited by pin 17 engaging another plastic bushing 20. The vibrations adjusting screw nut 18, is secured to the conical piece 14 by a fastening screw 21. Inside the conical spindle's end opposite to the small sphere b, is an orifice with screw threads in which a straight or bent vibrating arm 22, is screwed up; born by a supporting piece 23, which has inside an electrically isolated bushing 24, in order to protect the buccal cavity against electrocution, and a metallic bushing 24′ into which the vibrating arm 22 is threaded. Arm 22 supports a bumper 26 at its other end, the latter can have several shapes A, B, C, D, E (FIGS. 1 and 2a–2e) and hollows which can contain drugs, being ensured against unscrewing by a screw, or counter, nut 27.

The device introduced in the buccal cavity, although set into motion, produces vibrations only in the moment the bumper is passed onto the gums; that is the small sphere b receives the vibrating impulses due to the conical bushing 5 and it transmits the vibrations through the vibrating arm onto the pressed area.

To adjust the vibrations amplitude 2a the device is held with one hand and with the other the screw nut 18 is rotated in the direction of the clock's hands until the vibrations cease completely; subsequently the screw nut is turned with 360° in the counterclockwise direction and a vibration amplitude is obtained of 0.2 mm. and by repeating this action amplitudes of 0.4; 0.6; 0.8 are obtained, or by rotating with 180° amplitudes of 0.1; 0.2; 0.3; 0.4 . . .

By rotating in the opposite direction the amplitude of the vibrations is adequately, or proportionately reduced.

Beside this method of increasing or decreasing objectively the amplitude of the vibrations, the intensity of the vibrations can be changed subjectively by pressing more or less the bumper 26 on the treated area of the buccal cavity.

The device according to the present invention has the following advantages the fact that by massaging the gingival line and the interdental papilla of the parodontal tissues, the device can be used by the patient himself who can pass the bumper on the gums according to what extent he supports vibrations of certain intensities without having the disagreeable sensation of introducing the device in the mouth with the vibrating arm set to work; it can be simply sterilized by unscrewing only the vibrating arm and by turning nut 21, the remainder of the apparatus and introducind it in the sterilization solution, and it avoids the peril of the patient's electrocution during the treatment.

I claim:
1. An apparatus for the medical treatment of organic tissue by vibrations comprising, in combination:
   a. a lever having two opposite ends between which extends a longitudinal axis;
   b. a bumper rigidly attached to one end of said lever;
   c. means mounting said lever at a point intermediate its ends for pivoting movement in all directions about such point and for limited movement in the direction of its said longitudinal axis between a first position and a second position;
   d. means for biasing said lever toward said first position;
   e. means mounted for rotation about an axis and defining a cavity with an open end and an enclosed end, said cavity being in the slope of a truncated cone with an open larger end and disposed eccentrically with respect to the axis for rotation of said means defining a cavity; and
   f. engaging means rigidly attached to the other end of said lever and arranged inside of said cavity and out of contact with the sides of said cavity when said lever is in said first position, and in contact with the sides of said cavity only when said lever is pressed into said second position against said means for biasing so that said means defining the cavity causes vibrations to be set up in said engaging means, which vibrations pass through said lever to said bumper.
2. An apparatus as defined in claim 1, further including a framework for partly housing said lever, said lever mounting means said means mounted for rotation and said engaging means; a spindle, two bearings mounting said spindle for rotation, one end of said spindle having means for attachment to a rotating member and the other end of said spindle being rotatably attached to said means mounted for rotation.
3. An apparatus as defined in claim 2 wherein said lever defines a sphere between its two ends and said means mounting said lever has a sustaining bushing defining a seat to mate with said sphere of said lever, and said means for biasing has a helicoid spring with a flat end arranged to bias said sphere of said lever toward the spherical fitting of said sustaining bushing, and an adjusting screw nut attached to said framework and arranged to vary the tension on said springs.
4. An apparatus as defined in claim 14, wherein said lever has a bushing means at said one end for providing a quick disconnect and an electrical isolation for said bumper.
5. An apparatus as defined in claim 4, wherein said bumper has a bent vibrating arm, is interchangeable, and is hollow to allow oil and paste vitaminic substances.
6. An apparatus as defined in claim 5, wherein said bearings for mounting said spindle are interchangeable and removable from said framework, and said connecting means defines a square opening for receiving a mating section of said spindle, further including two thin plates adjacent the square opening, and a pin member passing through transverse openings defined in said spindle and said connecting means to secure said spindle with said connecting means, and a sleeve arranged around said connecting means to protect said connecting means, said sleeve being equipped with release means for coupling with the end of a flexible cable of a dental unit grinder, and a tightening screw nut means for connecting said connecting means in said sleeve to said framework.
7. An apparatus as defined in claim 6, wherein said framework has a conical piece for partly housing said lever and said adjusting screw nut is fastened to said conical piece, and said sphere of said lever is constructed of a hard alloy and defines a hole through its diameter; further including a fastening screw securing said screw nut to said conical piece, and a conducting pin passing through the opening defined in said sphere.
8. An apparatus as defined in claim 7, wherein said one end of said lever is a pin support piece with a metallic bushing arranged inside thereof, said bushing mounting said bumper being arranged within said metallic bushing, and further including a counter nut to retain said bumper in said bushing.
9. An apparatus as defined in claim 8, further including a plurality of felt gaskets, an orifice defined in said framework and a screw in said orifice, so that said spindle may be continuously greased.
10. An apparatus as defined in claim 9, wherein the frequency of the vibrations at said bumper is varied by the rate of rotation of said means mounted for rotation, the amplitude of the vibration at said bumper is varied by varying the position of said engaging means with respect to said cavity along said longitudinal axis, and the intensity of the vibrations at said bumper is varied by varying the pressure of said bumper on the organic tissue.
11. An apparatus as defined in claim 10, wherein said turning nut is so dimensioned that when it is rotated counterclockwise 360° from the point at which vibrations have ceased, an amplitude of vibration of 0.2 mm is obtained, and by repeating the 360° rotation, amplitudes of 0.4, 0.6, 0.8 . . . mm are obtained, and if said turning nut is rotated counterclockwise 180°, amplitude of 0.1, 0.2, 0.3, 0.4 . . . mm are obtained, and by turning said turning nut in the clockwise direction, the amplitude of vibration is proportionately reduced.